

Claims

What is claimed is:

- 1 1. A thermal management apparatus, comprising:
 - 2 a carrier substrate having a first side and an opposite second side and an
 - 3 opening extending from the first side to the second side; and
 - 4 a thermal conductor dimensioned to fit in the opening to facilitate transfer of heat
 - 5 generated by an electronic component attached to the first side for dissipation at the
 - 6 second side.

- 1 2. The thermal management apparatus of Claim 1, further comprising a first heat
- 2 dissipation device couple to the electronic component and the thermal conductor, and
- 3 configured to transfer heat generated by the electronic component to the thermal
- 4 conductor.

- 1 3. The thermal management apparatus of Claim 2, wherein the first heat dissipation
- 2 device is one of a low profile heat sink and heat spreader.

- 1 4. The thermal management apparatus of Claim 2, wherein the carrier substrate is
- 2 at least part compliant with a standard and the aggregate thickness of the component
- 3 and the first heat dissipation device is within a dimension requirement of the standard.

- 1 5. The thermal management apparatus of Claim 4, wherein the standard is PICMG
- 2 3.0 ATCA, and the dimension requirement is 4.66mm.

1 6. The thermal management apparatus of Claim 5, wherein first side is covered with
2 a nonconductive material and the aggregate thickness of the nonconductive material,
3 the component, and the first heat dissipation device is less than or equal to 4.66 mm.

1 7. The thermal management apparatus of Claim 1, wherein the one or more thermal
2 conductors are a selected one of a solid core conductor, a liquid filled conductor and a
3 heat pipe.

1 8. The thermal management apparatus of claim 1, wherein the device further
2 comprises a second heat dissipation device disposed on the second side and thermally
3 coupled to the one or more thermal conductors to dissipate said heat transferred away
4 from the component disposed on the first side.

1 9. The thermal management apparatus of Claim 8 wherein the second heat
2 dissipation device is configured to transfer heat to a surrounding environment.

1 10. The thermal management apparatus of Claim 9, wherein the second heat
2 dissipation device is one of an air cooled, liquid cooled, thermoelectric, and phase
3 change device.

1 11. The thermal management apparatus of Claim 8, wherein the second heat
2 dissipation device is removably coupled to the thermal conductors by fasteners and
3 retains the first heat dissipation device against the first side component.

1 12. The thermal management apparatus of Claim 8 wherein the second heat
2 dissipation device is configured to thermally couple to a component disposed on the
3 second side.

1 13. A modular platform, comprising:
2 a shelf;
3 a plurality of modular platform boards, at least one of the boards including a
4 thermal management apparatus, the thermal management apparatus comprising
5 a carrier substrate having a first side and an opposite second side and an
6 opening extending from the first side to the second side; and
7 a thermal conductor dimensioned to fit in the opening to facilitate transfer of heat
8 generated by an electronic component attached to the first side for dissipation at the
9 second side.

1 14. The modular platform of Claim 13, further comprising a first heat dissipation
2 device couple to the electronic component and the thermal conductor, and configured
3 to transfer heat generated by the electronic component to the thermal conductor.

1 15. The modular platform of Claim 14, wherein the first heat dissipation device is one
2 of a low profile heat sink and heat spreader.

1 16. The modular platform of Claim 14, wherein the carrier substrate is at least part
2 compliant with a standard and the aggregate thickness of the component and the first
3 heat dissipation device is within a dimension requirement of the standard.

1 17. The modular platform of Claim 16, wherein the standard is PICMG 3.0 ATCA,
2 and the dimension requirement is 4.66mm.

1 18. The modular platform of Claim 17, wherein first side is covered with a
2 nonconductive material and the aggregate thickness of the nonconductive material, the
3 component, and the first heat dissipation device is less than or equal to 4.66 mm.

1 19. The modular platform of Claim 13, wherein the one or more thermal conductors
2 are a selected one of a solid core conductor, a liquid filled conductor and a heat pipe.

1 20. The modular platform of claim 13 wherein the device further comprises a second
2 heat dissipation device disposed on the second side and thermally coupled to the one
3 or more thermal conductors to dissipate said heat transferred away from the component
4 disposed on the first side.

1 21. The modular platform of Claim 20 wherein the second heat dissipation device is
2 configured to transfer heat to a surrounding environment.

1 22. The modular platform of Claim 21, wherein the second heat dissipation device is
2 one of an air cooled, liquid cooled, thermoelectric, and phase change devices.

1 23. The modular platform of Claim 20, wherein the second heat dissipation device is
2 removably coupled to the thermal conductors.

1 24. The modular platform of Claim 20 wherein the second heat dissipation device is
2 configured to thermally couple to a component disposed on the second side.

1 25. A thermal management method, comprising:
2 providing a carrier substrate having a first side and an opposite second side and
3 an opening extending from the first side to the second side, and an electronic
4 component coupled to the first side;
5 providing a thermal conductor dimensioned to fit in the opening to facilitate
6 transfer of heat generated by an electronic component attached to the first side for
7 dissipation at the second side; and
8 transferring heat from the electronic component to the second side via the
9 thermal conductor.

1 26. The method of Claim 25, further comprising:
2 providing a first heat dissipation device coupled to the electronic component; and
3 coupling the first heat dissipation device to the thermal conductor.

- 1 27. The method of Claim 25, further comprising:
- 2 providing a second heat dissipation device;
- 3 coupling the second heat dissipation device to the thermal conductor on the
- 4 second side;
- 5 transferring heat from the thermal conductor to the second heat dissipation
- 6 device; and
- 7 transferring heat from the second heat dissipation device to a surrounding
- 8 environment.